



Title of Investigation:

Inspiring Blind and Visually Impaired Students with Earth Science

Principal Investigator:

Elissa Levine (Code 614.4)

Other In-house Members of Team (include Code):

Sallie Smith (Code 130)

Other External Collaborators:

National Federation of the Blind (NFB)

Initiation Year:

FY 2004

Aggregate Amount of Funding Authorized in FY 2004 and Earlier Years:

\$20,000

Funding Authorized for FY 2005:

\$15,000

Actual or Expected Expenditure of FY 2005 Funding:

In-house: \$9,000; Contracts: \$6,000 for Trainer Izolda Trakhtenberg

Status of Investigation at End of FY 2005:

Proposals pending

Expected Completion Date:

FY 2006

DDF annual report

Purpose of Investigation:

Blind and visually impaired students may be discouraged from taking science and engineering in school or pursuing a career in these fields because of the lack of accessible educational materials or technological tools. The number of blind scientists and engineers is less than 1 percent of the total population of blind and visually impaired (CDC National Center for Health Statistics, 1994-1995) persons in the U.S.

The goal of this work was to use hands-on, inquiry-based educational materials from Earth science programs to allow blind and visually impaired students to use their natural surroundings to learn. Educational materials and technology were developed for use in K-12 classrooms to help teachers include blind and visually impaired students in science-related activities. Through the use of these materials, students were encouraged to participate in existing Earth science teacher-student-scientist partnerships such as GLOBE and NASA Earth Science Enterprise Mission Science. Blind and visually impaired students will use their “backyard” as the learning laboratory. They may be motivated from this opportunity to pursue a career in NASA science and engineering.

Accomplishments to Date:

- Development of tactile materials (soil texture triangle, soil structure chart)
- Adaptation of existing “talking technology” for GLOBE protocol measurements (talking soil and air maximum/minimum thermometer; compass, color meter, tape measure, balance, calculator) to measure pH, soil depth, tree diameter, leaf soil and flower color, direction, air and soil temperature, soil moisture
- Design of protocol for teaching GLOBE soil, vegetation, and atmosphere measurements
- Presentation and test of materials and protocols with blind students in two National Federation of the Blind (NFB) summer science academies (July 2004 and 2005)
- Development of Web-based materials for distribution to the general community (<http://soil.gsfc.nasa.gov/touchtheearth/index.html>)

Reports, Journal Articles, Other:

Preparing an article entitled “Adapting GLOBE Protocols for Blind and Visually Impaired Students,” *J. Science Education for Students with Disabilities*

Papers for Presentation at Professional Society Meetings, Seminars, Symposia, and Other Important Forums:

Levine, E., “Inspiring Blind Students to Learn Earth Science with GLOBE,” Proceedings GLOBE 8th Annual Meeting, Boulder, CO, 2004.

Awards Received:

Goddard Space Flight Center Exceptional Achievement Award

Planned Future Work:

Creation of “Touch the Earth” book similar to other tactile books, including “Touch the Sun,” “Touch the Universe,” and “Touch the Stars,” which use remote-sensing satellite imagery of Earth and digital audio technology to communicate with blind and visually impaired students. We will do this in collaboration with NFB and Touch Graphics, Inc. (proposals pending).

Key Points Summary:

Project’s innovative features: The products developed in this project are the only ones to directly adapt GLOBE protocols for blind and visually impaired students.

Potential payoff to Goddard/NASA: This work closely adheres to Goddard’s mission of exposing blind students to knowledge of the Earth and its environment. This work also strongly supports the NASA Code N Education Enterprise mission to “inspire the next generation of explorers,” motivate students to pursue careers in science, technology, engineering and mathematics, and engage the public in NASA exploration and discovery. As an identified need, the first step in inspiring blind and visually impaired students to pursue careers in NASA science, technology, engineering, and mathematics is to provide access to NASA resources. In adapting existing resources, such as the GLOBE Protocols, innovative tools were specifically designed to meet the needs of blind and visually impaired. These tools allowed students to learn concepts and collect data related to NASA Earth Science Enterprise Mission Science.

The criteria for success: Developing effective learning materials and technology with adequate field testing, disseminating these materials, and receiving positive feedback from blind and visually impaired students who showed increased interest in pursuing science and engineering careers served as our criteria for success.

Technical risk factors: With adequate funding, we could have developed additional effective materials.